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## COMPOSITIONALITY

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#### ***DRAFT***

The Principle of Compositionality was first formulated by the German philosopher Gottlob Frege (1892) and is also referred as the Frege principle. The principle states that the meaning of a complex expression is a function of the meaning of its parts. A mapping from expressions to meanings that satisfies this principle is called *compositional*. Frege identified compositionality as a basic requirement for an account of the meaning of natural language, and all present serious accounts of sentence meaning are compositional. Therefore, current research seeks to find more restrictive notions of compositionality that can be used to assign a degree of compositionality to a semantic analysis as discussed below. The question of compositionality has also been asked for non-linguistic communication systems among humans and other species, which I mention towards the end.

For a semantics of natural language, compositionality is a basic requirement because humans can generate infinitely many sentences (see *DISCRETE INFINITY*) and associate them with one from an infinite set of meanings. Since human memory is a finite resource, there can only be a finite set of memorized lexical meanings (see *LEXICAL SEMANTICS*). It follows that natural language must contain non-lexical expressions and that the meaning of such non-lexical expressions is determined by a compositional procedure. Therefore, compositionality is a necessary property of any semantics of natural language that claims complete coverage. The result, however, leaves it open what the lexical expressions of natural language are and how many composition principles there are. Often words can be assigned a compositional meaning: for example the meaning of *slept* is the result of *sleep* combined with past tense. In other cases, however, syntactically complex phrases seem to have a non-compositional meaning: for example, that *kick the bucket* is synonymous with *die* does not follow naturally from the meanings of *kick* and *the bucket* (cf. *IDIOMS*). In the history of language, complex expressions often take on a non-compositional meaning over time (cf. *GRAMMATICALIZATION*.)

The composition principles are closely tied to a particular semantic theory. Compositionality plays a central role in *FORMAL SEMANTICS* and *TRUTH CONDITIONAL SEMANTICS* of natural language, while other theories of language meaning have not addressed compositionality (cf. *CONSTRUCTION GRAMMARS*, *COGNITIVE GRAMMAR*). The textbook by Heim and Kratzer (1998) provides one influential account. This account assumes that humans construct a syntactic representation of a sentence, the *LOGICAL FORM*, which is then mapped at the *SYNTAX-SEMANTICS INTERFACE* to a meaning. This mapping is a recursive procedure (cf. *RECURSIVITY*): Lexical items are mapped to the memorized lexical meaning. The meaning of a complex phrase, which are assumed to always consist of exactly two sub-phrase that may themselves be complex, however, is determined by one of three compositional procedures. Which compositional procedure is applied is determined by the types of the meanings of the two parts of the complex phrase. The most frequent case is that the meaning of one sub-phrase is a function while the other is a potential argument of the function. In this case, the meaning of the complex phrase is given by functional application. The two other composition principles are used for modification and for variable binding. In this way, three composition principles and a finite set of lexical meaning rules determine the interpretation of infinitely many sentences.

Recent work has pointed out a need to develop a stricter formal notion of compositionality. One motivation is the following theorem of Zadrozny (1994): If there is a function that assigns to each complete expression of a language a meaning, a compositional meaning function can also be given. This result relies on an extension of function beyond their natural domain. For example, we might construct a compositional semantics for the idiom *kick the bucket* in the following way: For one, stipulate that *the bucket* has in addition to its ordinary meaning also the special symbol X as its meaning. Secondly, define the meaning of *kick* applied to X as the meaning of *die*. Then the meaning of *kick the bucket* is compositionally defined as the meaning of *kick* applied to the meaning of *the bucket*. However, this result strikes most researchers as intuitively undesirable. For this reasons, current research tries to formulate notions of compositionality stricter than Frege's that capture this intuitive difference (Kazmi and Pelletier 1998, Szabó 2000). In particular, Kazmi and Pelletier suggest to restrict the use of functions as meanings, but it is still an open question how exactly to do this (cf. Lappin and Zadrozny 2000).

Looking beyond human language, compositionality has emerged as an important property to classify communication systems. Horton (2001) investigates the compositionality of music (see *MUSIC, LANGUAGE AND*). Even more interesting is the case of animal communication and human evolution (Bickerton 1990). Spelke (2003) proposes that the compositional semantics is crucial for human intelligence. She argues that humans and higher animals possess a similar ability to form basic concepts. Only humans, however, via the compositional semantics of language have the ability to combine these basic concepts into an infinite array of derived concepts (see *ANIMAL COMMUNICATION AND HUMAN LANGUAGE*).

### Works Cited and Suggestions for Further Reading

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